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10/537,151

05/31/2005

Yuichi Fujioka

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WENDEROTH, LIND & PONACK, L.L.P.

2033 K STREET N. W.

SUITE 800

WASHINGTON, DC 20006-1021

EXAMINER

MCCRACKEN, DANIEL

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/537,151	Applicant(s) FUJIOKA ET AL.	
	Examiner DANIEL C. MCCracken	Art Unit 1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 5/31/2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 54-111 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 54-111 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>5/31/2005, 11/6/2007</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Citation to the Specification will be in the following format: (S. # : ¶/L) where # denotes the page number and ¶/L denotes the paragraph number or line number. Citation to patent literature will be in the form (Inventor # : LL) where # is the column number and LL is the line number. Citation to the pre-grant publication literature will be in the following format (Inventor # : ¶) where # denotes the page number and ¶ denotes the paragraph number.

Remarks

Applicants preliminary amendment filed 5/31/2005 has been recieved. Claims 1-53 are acknowledged as cancelled. Claims 54-111 are pending.

Information Disclosure Statement

The Examiner has considered the relevance of all foreign patent documents insofar as the translated abstract indicates. "The duty of candor does not require that the applicant translate every foreign reference, but only that the applicant refrain from submitting partial translations and concise explanations that it knows will misdirect the examiner's attention from the reference's relevant teaching." *Semiconductor Energy Laboratory Co. v. Samsung Electronics Co.*, 204 F.3d 1368, 1378, 54 USPQ2d 1001 1008 (Fed. Cir. 2000).

The listing of references in the specification is not a proper information disclosure statement. 37 CFR 1.98(b) requires a list of all patents, publications, or other information submitted for consideration by the Office, and MPEP § 609.04(a) states, "the list may not be incorporated into the specification but must be submitted in a separate paper." Therefore, unless

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the references have been cited by the examiner on form PTO-892, they have not been considered. If there are any references in the Specification not listed on an Information Disclosure Statement, they should be submitted, as the Examiner considers them material to patentability. Appropriate translations are expected.

Specification

The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is expected in correcting any errors of which applicant may become aware in the specification.

Drawings

At least Figure 49 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance. Applicants apparently admit this material is old at (S. 2: 1). Applicants are responsible for labeling any other drawings that are prior art as such.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 54-71, 81, and 100-111 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

With respect to Claims 54-71, it is unclear what morphologies are being claimed, especially in light all of those disclosed in the Specification. As such, the dimensions are meaningless. Are Applicants referring to dimensions of a graphene sheet in a single walled carbon nanotube or platelets? This indefiniteness precludes a targeted search. With respect to Claim 81, “metallizing” is unclear. If this means something to a Japanese machine translator, it doesn’t mean anything to this Examiner. How do you “metallize” something? As to Claims 100-111, process limitations do not limit apparatus claims. The flow of a gas is not part of the reactor. Nor is what happens between the catalyst and the fluid/gas. These are method steps.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

The reference teaches each and every limitation of the rejected claims. The pinpoint citations are in no way to be construed as limitations of the teachings of the reference, but rather illustrative of particular instances where the teachings may be found. It is noted that Applicants have presented

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some product-by-process claims. *See e.g.* Claim 71. “[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.” *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985) (citations omitted). *See also* MPEP 2113, et seq. This explanation was made once for brevity’s sake, and is incorporated into each and every rejection herein by reference where necessary.

Claims 54-71 are rejected under 35 U.S.C. 102(b) as being anticipated by Rodriguez, et al., *Catalytic Engineering of Carbon Nanostructures*, Langmuir 1995; 11: 3862-3866.

With respect to all claims, Rodriguez appears to disclose the morphologies Applicants have disclosed in their Specification. The drawings in Rodriguez appear to be the same as those relied upon by Applicants for support for all product claims. *Compare* (Rodriguez "Figs. 1-3") *with* (S. "Figs"). *See above* with respect to product-by-process claims.

Claims 54-72, 74-76, 78-88, 90-99, 101-111 are rejected under 35 U.S.C. 102(b) as being anticipated by US 6,413,487 to Resasco, et al.

With respect to Claims 54-71, as noted *infra*, the process used to make Applicants process is taught. Given that the process is taught (reactor, catalyst, feed source, etc.) is taught, it is expected that all products are taught. This is the evidence offered to show inherency. “[T]he

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PTO can require an applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his [or her] claimed product. Whether the rejection is based on inherency' under 35 U.S.C. 102, on prima facie obviousness' under 35 U.S.C. 103, jointly or alternatively, the burden of proof is the same...[footnote omitted]." The burden of proof is similar to that required with respect to product-by-process claims. *In re Fitzgerald*, 619 F.2d 67, 70, 205 USPQ 594, 596 (CCPA 1980) (quoting *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433-34 (CCPA 1977)).

With respect to Claim 72, Resasco teaches a fluidized bed process with catalysts on a support. *See generally* (Resasco 3: 20 *et seq*) (general process) *and* (Resasco 7: 58 *et seq*) (catalyst support). Any of processes described in Resasco for preparing the catalyst are being interpreted as having the binder (e.g. solution impregnation). A reducing gas is taught. (Resasco "Fig 1, Step C"). Carbon is supplied. (Resasco "Fig 1, Step D"). A carbon free gas is supplied. (Resasco "Fig 1, Step E"). As to Claim 74, the catalyst is supported on a carrier/substrate. (Resasco 7: 52 *et seq.*). As to Claim 75, silica is recited. (Resasco 7: 59). As to Claim 76, the catalysts are taught. *See e.g.* (Resasco 7: 12-27). As to Claim 78, as it is expected that at some point Resasco would have wanted to shut his reactor down (or start it up), it is expected that valves are necessarily present to "control conditions." As to Claim 79, Resasco too recognizes that temperature, pressure, time and gas atmosphere are important parameters. (Resasco 3: 46-64). As to Claim 80, a temperature of 750 C is taught. (Resasco 4: 18). A pressure of 6 atm is taught. (Resasco 4: 14). Hydrogen and inerts are taught. *See e.g.* (Resasco 4: 22-26). As to Claim 81, whatever metallizing means, it is expected that Resasco teaches it. Resasco teaches a reducing step. (Resasco "Fig 1, Step C"). As to Claim 82, any gas feed sufficient to fluidize a bed

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is expected to keep the catalyst particles separated. As to Claim 83, catalysts bump into each other in a fluidized bed reactor, like Resasco. That is how they work – if this were not the case, it would be some sort of monolithic catalytic reactor and not a fluidized bed reactor. As the catalysts are fluidized, it is expected that whatever “wear” Applicants are claiming is necessarily taught by Resasco. As to Claim 84-85, Resasco teaches high velocities (however discusses it as space velocity, *see e.g.* Resasco 8: 38). As such, it is expected that “zones” (which are totally arbitrary) are necessarily taught. As to Claim 86, Resasco recycles the catalysts. *See e.g.* (Resasco "Abstract"). As to Claim 87, separation of the catalyst from the nanotube is taught. (Resasco "Fig. 1, Step I.").

With respect to Claim 88, Resasco teaches a fluidized bed reactor. *See e.g.* (Resasco “Fig. 2-5;” 12: 47 *et seq.*) Gas supply means or their equivalents are disclosed. *Id.* Reducing (Resasco “Fig 1, step C”) and introducing carbon gas (Resasco “Fig. 1, step D”) are taught. As to Claim 89, recovery means are taught. (Resasco “Fig. 1, steps H-P”). As to Claim 90, as noted above, a fluidized bed reactor it taught. It has “high velocity” and “low velocity” portions whenever you run a high-velocity gas or low velocity gas through it. As to Claim 91, this reads on the reactor wall. As to Claims 92-93, Resasco describes moving/blowing a gas, ergo it necessarily discloses the means to do so. (Resasco 12: 47 *et seq.*). As to Claims 94-99, multiple chambers connected by pipes are taught. *See e.g.* (Resasco “Figs. 4-5”). Resasco teaches gas moving through a reactor, ergo it necessarily teaches means for transporting the gas through the reactor. As to Claims 101-103, a catalyst on a support is taught. (Resasco col. 7). As to Claims 104 and 110, notwithstanding the indefiniteness issues *supra*, gas flows through the reactor. At somepoint (i.e.

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startup - even if only for a fraction of a second - the velocity is taught). As to Claim 105-109 and 111, notwithstanding the indefiniteness issues *supra*, catalysts are taught. (Resasco, col. 7).

Applicants claims may read on other embodiments disclosed by Resasco. Applicants are responsible for the entire contents of Resasco.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later

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invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

The references cited teach each and every limitation of the rejected claims. The pinpoint citations are in no way to be construed as limitations of the teachings of the reference, but rather illustrative of particular instances where the teachings may be found. As to the rejection under 35 U.S.C. §§ 102/103, where the applicant claims a composition in terms of a function, property or characteristic and the composition of the prior art is the same as that of the claim but the function is not explicitly disclosed by the reference, the Examiner may make a rejection under both 35 U.S.C. 102 and 103, expressed as a 102/103 rejection. See MPEP 2112 III. (discussing 102/103 rejections).

Claims 54-71 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Rodriguez, et al., *Catalytic Engineering of Carbon Nanostructures*, Langmuir 1995; 11: 3862-3866.

The preceding discussion of Rodriguez accompanying the anticipation rejection is expressly incorporated herein by reference. See above with respect to 102/103 claims.

Claims 54-72, 74-76, 78-88, 90-99, 101-111 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over US 6,413,487 to Resasco, et al.

The preceding discussion of Resasco accompanying the anticipation rejection *supra* is expressly incorporated herein by reference. See above with respect to 102/103 rejections.

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Claims 73, 82, 100, and 106 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 6,413,487 to Resasco, et al. as applied to claim 72 above, and further in view of US 5,618,875 to Baker, et al., US 7,052,668 to Smalley, et al., Dai, et al., *Single-wall nanotubes produced by metal-catalyzed disproportionation of carbon monoxide*, Chemical Physics Letters 1996; 260: 471-465, Choi, et al., *Controlling the diameter, growth rate, and density of vertically aligned carbon nanotubes synthesized by microwave plasma-enhanced chemical vapor deposition*, Applied Physics Letters 2000; 76(17): 2367-2369, Willems, et al., *Control of the outer diameter of thin carbon nanotubes synthesized by catalytic decomposition of hydrocarbons*, Chemical Physics Letters 2000; 317: 71-76, and Kaatz, et al., *Diameter control and emission properties of carbon nanotubes grown using chemical vapor deposition*, Materials Science and Engineering C 2003; 23: 141-146.

The preceding discussion of Resasco accompanying the anticipation rejection *supra* is expressly incorporated herein by reference. To the extent Resasco *may* not disclose the catalyst size, this does not impart patentability. The effect of catalyst size on the resulting “nanocarbon” is old and well known, readily optimized by the skilled artisan. The Examiner takes official notice that this is old and known. In support of taking official notice (i.e. in making sure there is “substantial evidence” on the record), the Examiner provides this *sampling* of prior art:

1. US 5,618,875 to Baker, et al. at 5: 9-10 (“The catalyst particle size determines the diameter of the filament”)
2. US 7,052,668 to Smalley, et al. at 8: 25-28 (“Typically, the diameter of the growing carbon nanotube is proportional to the size of its active catalyst cluster at the time the carbon nanotube begins to grow.”)
3. Dai, et al., *Single-wall nanotubes produced by metal-catalyzed disproportionation of carbon monoxide*, Chemical Physics Letters 1996; 260: 471-465 at 474 (“The most striking feature of SWNT grown by the present method is the attachment of

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a single catalytic particle to every tube, and their commensurate diameters (Fig. 2). Such an identification, often noted for catalyzed multiwall tubes [9-11], *makes clear that the diameter of the nanotube is controlled by the size of the catalytic particle*, as is consistent with the proposed mechanism.”) (emphasis added).

4. Choi, et al., *Controlling the diameter, growth rate, and density of vertically aligned carbon nanotubes synthesized by microwave plasma-enhanced chemical vapor deposition*, Applied Physics Letters 2000; 76(17): 2367-2369 at 2369 (“Thus, the diameter of a carbon nanotube is determined by the grain size of catalyst metals.”).
5. Willems, et al., *Control of the outer diameter of thin carbon nanotubes synthesized by catalytic decomposition of hydrocarbons*, Chemical Physics Letters 2000; 317: 71-76 at 73 (“From the data in Table 2, *it is obvious* that it is possible to synthesize nanotubes with the desired outer diameter distribution by choosing the catalyst to be used.”) (emphasis added).
6. Kaatz, et al., *Diameter control and emission properties of carbon nanotubes grown using chemical vapor deposition*, Materials Science and Engineering C 2003; 23: 141-146 at 144 (“These reports typically associate the control of CNT diameters with the grain size of the metal catalyst used.”).

This list is by no means exhaustive, and it goes almost without saying that catalyst size is a result-effective variable. Optimization does not impart patentability. *In re Boesch*, 205 USPQ 215, 219 (CCPA 1980).

Claims 77, 104, 94-99 and 110 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 6,413,487 to Resasco, et al.

The preceding discussion of Resasco with respect to Claims 72 and 88 is expressly incorporated herein by reference. Resasco teaches space velocity. *See e.g.* (Resasco 8: 38). Note that space velocity is the quotient of volumetric flow rate and reactor volume. Absent reactor dimensions, it is impossible to calculate an exact velocity. As to Claims 77, 104 and 110, to the

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extent Resasco may not disclose the velocity claimed, Resasco discloses that space velocity affects yield. (Resasco 3: 45-64). Stated differently, velocity is a result effective variable, the optimization of which is well with in the ordinary skill in the art. *In re Boesch*, 205 USPQ at 219.

With respect to Claims 94-99, to the extent Resasco *may* not disclose whatever multiple chambers Applicants are trying to claim, duplications of parts does not impart patentability. *In re Harza*, 274 F.2d 669, 124 USPQ 378 (CCPA 1960). Likewise, operating several reactors in species is not inventive. *See Id.*

Conclusion

Greater clarity in product morphology *in the claims* is needed. More rejections could have been crafted, but were considered cumulative at this time. There are more Resasco patents out there. Likewise, the Japanese and Chinese have shown interest in fluidized bed synthesis of “nanocarbons.”

All amendments made in response to this Office Action must be accompanied by a pinpoint citation to the Specification (i.e. page and paragraph or line number) to indicate where Applicants are drawing their support.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DANIEL C. MCCracken whose telephone number is (571)272-6537. The examiner can normally be reached on Monday through Friday, 9 AM - 6 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley S. Silverman can be reached on (571) 272-1358. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Daniel C. McCracken/
Daniel C. McCracken
Examiner, Art Unit 1793
DCM

/Stuart Hendrickson/
Stuart L. Hendrickson
Primary Examiner